Periphyton system of some selected substrates and their exploitation for culture of Indian Major Carp (IMC)

A synopsis submitted to

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❖ Abstract:

Periphyton is the microfloral community living attached to surface of submerged objects in water (Wetzel, 1983). Periphyton is complex of attached aquatic biota on submerged substrates including associated non-attached organisms and detritus (Azim *et al*., 2001). Periphytons are the microorganisms growing on stones, sticks aquatic macrophytes, and submerged surfaces (APHA, 1998). Periphyton is grazed by aquatic ecosystem (Piska and Murlikrishna, 2009).

Fish culture technology for *Oreochromis niloticus* was developed, in growing periphyton on three different substrates to provide additional nourishment to the fish through supplementary feeding of periphyton as well as to reduce the accumulation of nitrogenous compounds in the water column through effective recycling of organic wastes (K. Ranjeet and P.V.P. Shahul Hameed, 2015). Periphyton based aquaculture is a recent concept and eco-friendly approach in the pond aquaculture. Periphyton is a preferable natural food for herbivorous and omnivorous fish species especially for Indian major carps (Keshavanath *et al*., 2002) and tilapias (Azim *et al*., 2003).

The periphyton provides the primary production for aquatic system and it also indicator of pollution. The IMC growth has been observed high on the substrates added as compare to without substrates added system. Substrates added system improves the quality of water as compare without substrates added system.

❖ Introduction:

Periphyton is the microfloral community living attached to surface of submerged objects in water (Wetzel, 1983). Periphyton is complex of attached aquatic biota on submerged substrates including associated non-attached organisms and detritus (Azim *et al*., 2001). Periphytons are the microorganisms growing on stones, sticks aquatic macrophytes, and submerged surfaces (APHA, 1998). Periphyton is grazed by aquatic ecosystem (Piska and Murlikrishna, 2009). Periphyton production a variety of biodegradable (natural) and non-biodegradable (artificial) substrates are used (Keshavnath, 2001). The concentration of periphytic algae and micro periphyton on the studied biotic substrates was considerably higher compared to the organisms grown on the artificial substrates (Siaka *et al*., 2009).

Periphytic community displays clear temporal and spatial heterogeneity, showing variations in their composition, biomass and productivity (Khatoon *et al.*, 2007). A wide range of fish and benthic invertebrates including snails, chironomids, mayflies, oligochaetes and several groups of crustaceans that include periphyton in their diet (Jones *et al*,1997). The artificial substrates formed the biofilm in water (Cohen, 2001). The periphytic microorganisms serve as reducers and nutrient processors (Lock *et al*., 1985) in addition to providing a habitat for a variety of other organisms (Uddin *et al*., 2007).

The utilization of substrates was used for periphytic community fixation and increase food availability for fishes. Periphyton community is good source of natural and nutritional food, and provides primary productivity that supports a wide range of aquatic organism easily grazed upon by small invertebrates, fishes and shrimps, and hence contributes considerable to the productivity of aquatic ecosystem, so considered as a source of low cost live food for fish (Shivaji *et al*., 2012).

❖ Review of Literature:

A cost-effective fish culture technology for *Oreochromis niloticus* was developed, in growing periphyton on three different substrates to provide additional nourishment to the fish through supplementary feeding of periphyton as well as to reduce the accumulation of nitrogenous compounds in the water column through effective recycling of organic wastes (K. Ranjeet and Shahul Hameed, 2015). Periphyton performed role in the development or cultured of fishes. It is used as rich aquatic feed for fishes (Saikia and Das, 2009). Periphyton is grazed by aquatic organisms (Piska and Murlikrishna, 2009). The concentration of periphytic algae and micro periphyton on the studied biotic substrates was considerably higher compared to the organisms on the artificial substrates (Saikia *et al.*, 2009). The importance of periphytic organisms as feed for young fish has been reported (Assuduzaman, 2009), such as laboratory food sources or culture systems. Periphyton based aquaculture is a recent concept and eco-friendly approach in the pond aquaculture. Periphyton is a preferable natural food for herbivorous and omnivorous fish species especially for Indian major carps (Keshavanath *et al*., 2002) and tilapias (Azim *et al*., 2003).

❖ Objectives of Research:

1) *Ex-Situ* growth of periphyton on some selected substrates and their analysis.
2) *Ex-Situ* culture of IMC and their yield production in the periphyton based systems.
3) Periphytic C/N ratio and their correlation with IMC cultural growth and production.
4) Proximate analysis of periphyton samples and their correlation to culture of IMC.
5) Correlation of biofilm and biofouling in the IMC culture.
6) Carcass analysis of IMC and their correlation with the periphytic diversity.

❖ Methodology to be adopted:

➢ Collection of planktonic water sample:

The planktonic water samples have been collected from any plankton containing pond or river.

➢ Collection of substrates:

The some easily available agricultural and wastes material have been collected for use as a substrates in periphytic system.

➢ Preparation of substrates:

The substrates have been dried under shade and cut the agriculture wastes into equal size.

➢ *Ex-situ* culture of IMC in the periphytic systems:

The periphyton with IMC has cultured in the artificial constructed pond.

➢ physico-chemical analysis of water and soil-manure:

The IMC cultured related important physico-chemical parameters have been analyzed by standard method.

➢ Analysis of periphyton and IMC:

The periphyton analysis have been analyzed by various parameters like total count, biomass etc. The fish growth has been determined by various parameters.

➢ Statistical Analysis:

The data can be analyzed by various related parameter of statistics.

❖ Probable outcome:

The periphyton provides the primary production for aquatic system and it also indicator of pollution. The IMC growth has been observed high on the substrates added as compare to without substrates added system. Substrates added system improves the quality of water as compare without substrates added system.

❖ Importance of study or Society application:

➢ International status:

According to the latest available statistics collected globally by FAO, Marine fish culture India's got 7^{th} rank and Inland fishery of India's 2^{nd} position in the world (FAO, 2014). So the periphyton based fish culture systems provide maximum export of fish to abroad and get more profit from it.

➢ National Status:

The India's largest income source is agriculture. Agriculture of India's depending on the seasons. The seasons of agriculture is going off farmer's waaited for next season. So, the farmers can use periphyton based fish culture for their off season of agriculture. It provides more benefits to farmers.

➢ Significance of the study:

This study is beneficial to common man or poor farmers because they use their agricultural wastes products and formation of new fish feed for increasing fish yield and income. Still, fish is major diet of Indians.

❖ Proposed work Plan:

➢ Year-wise Plan of work and targets to be achieved:

Year	Target to be achieved
First Year (2016-2017)	✓ Reference collection ✓ Water and substrate collection ✓ Analysis of water and soil-manure ✓ Periphyton and IMC culture
Second Year (2017-2018)	✓ Analysis of periphyton and IMC ✓ Statistical Analysis of obtained data ✓ Paper writing ✓ Thesis writing

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